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AQUARIUM AERATING PUMP
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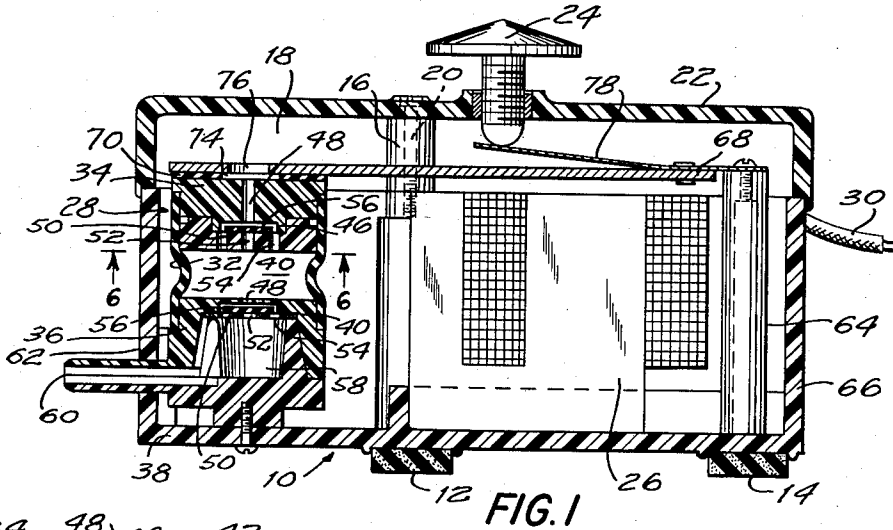


FIG. 1

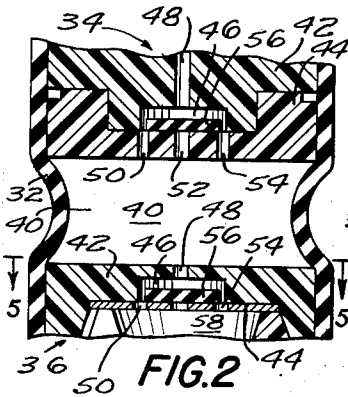


FIG. 2

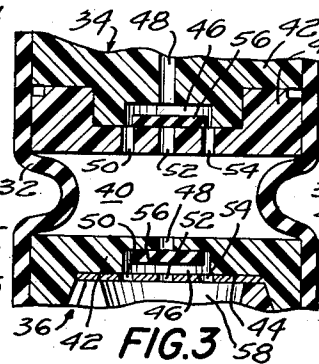


FIG. 3

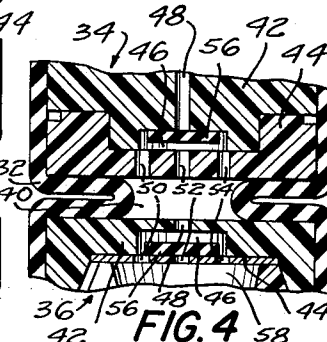


FIG. 4

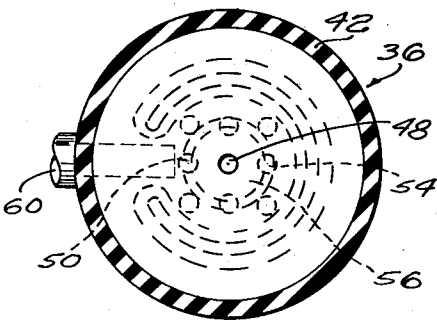


FIG. 5

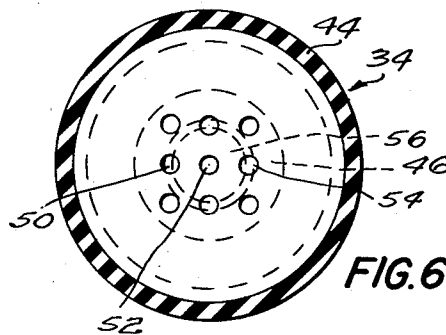


FIG. 6

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AQUARIUM AERATING PUMP

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3 Claims. (Cl. 230—162)

This invention relates to pumps and more particularly, to devices for pumping air and other gases.

It is a primary object of the present invention to provide a portable pump of simple yet durable construction which is inexpensive to manufacture and readily miniaturized.

It is another important object of the present invention to provide a highly efficient pump for the pumping of air and other gases.

It is still another important object of the present invention to provide a pump for fluids wherein the efficiency of the pump is not reduced by the backflow of the air being pumped.

It is still a further object of the present invention to provide a pump which is perfectly adapted for pumping air into aquarium tanks.

Briefly stated, the pumping device of the present invention comprises a strip of collapsible tubing, closure members in interconnection with the tubing at each end thereof to close same off, conduit means formed in each closure member to permit air to pass through the tubing, and vibratory means associated with one of said closure members to rapidly move same towards and away from the other closure member thereby repeatedly collapsing the tubing and effecting the passage of air therethrough.

A fuller understanding of the invention and the manner in which its objectives and advantages may be realized will become apparent from the following detailed description thereof taken in connection with the accompanying drawings wherein:

Fig. 1 is a sectional view of an embodiment of the pumping device of the present invention;

Fig. 2 is an enlarged sectional view of the pumping chamber shown in Fig. 1 in fully extended position;

Fig. 3 is an enlarged sectional view of the pumping chamber shown in Fig. 1 during an intermediate stage in the operation of the device;

Fig. 4 is an enlarged sectional view of the pumping chamber shown in Fig. 1 in fully collapsed position;

Fig. 5 is a sectional view of the fixed closure member taken on line 5—5 of Fig. 2 in the direction of the arrows; and

Fig. 6 is a sectional view of the movable closure member taken on line 6—6 of Fig. 1 in the direction of the arrows.

Referring now to the drawing and more particularly Fig. 1 thereof, the pumping device of the present invention is housed in rectangular casing 10 which in turn is mounted upon spaced support members 12 and 14 which carry the full weight of the device. Oppositely disposed elongated projections 16 extending inwardly into casing 10 from side walls 18 are bored for threaded engagement with metal screws 20 which hold casing cover 22 securely on the casing. A set screw 24 extends through a threaded bore in cover 22 for reasons hereinafter appearing. In this particular instance, casing 10, cover 22 and set screw 24 have been molded from plastic and are

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of clear composition permitting the pump to be viewed when housed within casing 10.

Projections 16 extending into casing 10 divide the casing into two chambers, electro-magnetic vibrator 26 being housed in one chamber and pump mechanism 28 being housed in the other chamber. The electro-magnetic vibrator utilized herein is of conventional construction consisting of a laminated core surrounded by a winding having infinite turns and operating on an alternating current. The winding is connected to a source of current by cable 30 which extends from casing 10 through a port in side wall 18.

Pump mechanism 28 consists of a strip of collapsible tubing 32, preferably of elastic composition for reasons hereinafter appearing. Conventional thin-walled rubber tubing is well suited herein. Closure members 34 and 36 are inserted within tubing 32 at each end thereof in this particular embodiment of the invention. The rubber tubing is preferably stretched over stationary closure member 36, which is affixed to bottom wall 38 of casing 10, and thereby anchored in the casing. Tubing 32 is also stretched over closure member 34 to hold same firmly in position near cover 22 of casing 10. It can thus be seen that collapsible tubing 32 and closure members 34 and 36 form a chamber 40 for the pumping of air, the operation of which will be hereinafter described.

Closure members 34 and 36 each consist of a first member 42 superposed upon a second member 44, a shallow recess 46 being formed in second member 44 at the interface of members 42 and 44. A conduit 48, which communicates with recess 46, is formed in member 42 to permit air to pass therethrough. Spaced conduits 50, 52, 54 also communicating with recess 46 are formed in member 44 to permit the passage of air through member 44.

A pressure responsive disc 56 is movably mounted in recess 46 being adapted to close conduit 48. Movable closure member 34 and stationary closure member 36 are of similar construction with the exception that in the stationary closure member the second member 44 is supported above a chamber 58 which communicates with an outlet duct 60 extending through end wall 62 of casing 10.

Projections 64 which extend interiorly into casing 10 from end wall 66 provide the means whereupon pole member 68 is mounted. Pole member 68 extends from its mounting across electro-magnetic vibrator 26, its free end being supported by the head of movable closure member 34. A shock absorbent mat 70 is adhered to the underside of pole member 68 where the pole member bears upon the head of movable closure member 34. Apertures formed in the free end of pole member 68 (not shown) and in mat 70 at 74 are aligned with each other and with conduit 48 to provide a passageway from the interior of casing 10 to pumping chamber 40. In this particular embodiment of the invention, the aperture in pole member 68 is covered by filter 76 to keep dust and other solid particles from clogging the conduits leading to chamber 40 while permitting the unrestricted flow of air through the said conduits. A leaf spring 78 affixed to pole member 68 near its mounting bears upwardly against set screw 24.

The operation of the device commences, in this particular instance, with the attachment of hosing (not shown) to outlet duct 60 for insertion into an aquarium tank. Electro-magnetic vibrator 26 is actuated causing pole member 68 to reciprocate upon the head of movable closure member 34 which in turn causes the said closure member to rapidly move towards and away from stationary closure member 36. By virtue of rapidly reciprocating closure member 34, elastic tubing 32 is caused

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to collapse and expand in accordion-like fashion, as may be seen in Figs. 2-4. As the tubing is collapsed, the pressure within chamber 40 increases causing pressure responsive disc 56 to move over conduit 48 to prevent the escape of chamber air through the said conduit. (See movable closure member 34 in Fig. 4.) The pressurized chamber air is necessarily forced through the conduits of the stationary closure member and through outlet duct 60. As movable closure member 34 returns to the rest position (see Fig. 3), the air within chamber 40 is rarefied and the pressurized air from outlet duct 60 causes pressure responsive disc 56 of the stationary closure member to close conduit 48 and prevents the backflow of air from the outlet.

The pressure of the air issuing from the outlet duct may be increased or decreased by closing or opening the gap between leaf spring 78 and pole member 68 by means of set screw 24.

As will be realized from the foregoing, a pump has been provided where efficiency is not reduced by the backflow of the air being pumped. Moreover by this invention, a portable pump has been provided which is of simple yet durable construction and which may be inexpensively manufactured and readily miniaturized. Additionally, by this invention a pump has been provided which is perfectly adapted for pumping air into aquarium tanks.

Although the invention has been described in detail with respect to one preferred embodiment thereof, it will be understood by those skilled in the art, after reading this specification, that various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A pumping device comprising an elastic strip of collapsible tubing, closure members inserted in said tubing at each end thereof to close same off, the said elastic tubing being tightly stretched over each closure member to hold same in position, each closure member comprising a first member superposed upon a second member having a shallow recess formed therebetween, the said first member having conduit means communicating with said recess to permit the passage of fluid through said first member, the said second member having spaced conduit means in communication with the said recess to permit the passage of air through the said second member, a pressure responsive disc movably positioned in the recess, the said disc being maintained between the conduit means of the first member and at least one of the spaced conduit means of the second member, and vibratory means operatively connected with one of said closure members to rapidly move same towards and away from the other closure member repeatedly collapsing the tubing and effecting the passage of air therethrough, the backflow of air through said tubing being prevented by the pressure responsive discs closing the conduit means of the first member as the pressure within the tubing varies with respect to atmospheric pressure.

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2. A pumping device comprising a strip of collapsible tubing, closure members inserted within the tubing at each end thereof to close same off, each closure member comprising a first member superposed upon a second member having a shallow recess formed therebetween, the said first member having conduit means communicating with said recess to permit the passage of air through the said first member, the said second member having spaced conduit means in communication with the said recess to permit the passage of air through the said second member, a pressure responsive disc movably positioned in the recess, said disc being maintained between the conduit means of the first member and at least one of the spaced conduit means of the second member, and vibratory means operatively connected with one of said closure members to rapidly move same towards and away from the other closure member repeatedly collapsing the tubing and effecting the passage of air therethrough, the backflow of air through said tubing being prevented by the pressure responsive discs closing the conduit means of the first member as the pressure within the tubing varies with respect to atmospheric pressure.

3. A pumping device comprising a strip of collapsible tubing, closure members inserted within the tubing at each end thereof to close same off, each closure member comprising a first member superposed upon a second member, one of said members having a shallow recess to provide an interspace between said first and second members, the said first member having conduit means formed therein and communicating with said interspace to permit the passage of air therethrough, the said second member having spaced conduit means formed therein to communicate with the interspace and to permit the passage of air therethrough, a pressure responsive disc positioned in the interspace between the said first and second member, said disc being movably maintained between the conduit means of the first member and at least one of the spaced conduit means of the second member, and vibratory means operatively connected with one of said closure members to rapidly move same towards and away from the other closure member repeatedly collapsing the tubing and effecting the passage of air therethrough, the backflow of air through the tubing being prevented by the pressure responsive discs closing the conduit means of the first member as the pressure within the tubing varies with respect to atmospheric pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

194,010	Stewart	Aug. 7, 1877
723,042	Schwerin	Mar. 17, 1903
1,351,210	Heiliger	Aug. 31, 1920
2,673,938	Winkelman	Mar. 30, 1954

FOREIGN PATENTS

58,670	France	Oct. 28, 1953
438,404	Great Britain	Nov. 15, 1935